DOCKET FILE COPY ORIGINAL

RECEIVED

JUN 25 1998

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	CC Docket No. 96-45
Federal-State Joint Board on	)	
Universal Service	)	
	)	CC Docket No. 97-160
Forward-Looking Mechanism	)	APD No. 98-1
for High Cost Support	)	DA 98-1055

**COMMENTS OF U S WEST COMMUNICATIONS, INC.
ON STATE FORWARD-LOOKING COST STUDIES FOR
UNIVERSAL SERVICE SUPPORT**

Robert B. McKenna
John L. Traylor
Suite 700
1020 19th Street, N.W.
Washington, DC 20036
(303) 672-2798

Attorneys for

U S WEST COMMUNICATIONS, INC.

Of Counsel,
Dan L. Poole

June 25, 1998

No. of Copies rec'd 0+4
List ABCDE

TABLE OF CONTENTS

Page

SUMMARY

In the Universal Service Order, the Commission concluded that all methodologies used to calculate the forward-looking economic cost of providing universal service in rural, insular, and high-cost areas must meet the criteria adopted by the Commission. For those states who choose to submit their own forward-looking economic cost studies, the Commission said that it would approve a state's cost study only if the state has conducted a study that meets the Commission's criteria.

The Public Service Commissions in the states of Montana and Nebraska each unanimously selected the BCPM over the HAI model. In each state commission's view, the BCPM not only satisfies the Commission's criteria but it also provides the best assurance that federal universal service support funding for non-rural LECs serving rural, insular, and high-cost areas in their state will be adequate.

The Minnesota Commission narrowly selected the HAI model over the BCPM. Although the Minnesota Commission concluded that the HAI model complies with the Commission's criteria, new evidence indicates that the HAI model contains a serious flaw. The model's geocoding methodology is unable to locate rural customers accurately and, as a result, it understates the costs of distribution plant facilities. This defect seriously undermines any confidence that universal service support funding based upon use of the HAI model for non-rural LECs serving rural, insular, and high-cost areas in a state will be adequate. Accordingly, U S WEST does not support the Minnesota Commission's selection.

RECEIVED
JUN 25 1998
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of	)	
	)	CC Docket No. 96-45
Federal-State Joint Board on	)	
Universal Service	)	
	)	CC Docket No. 97-160
Forward-Looking Mechanism	)	APD No. 98-1
for High Cost Support	)	DA 98-1055

**COMMENTS OF U S WEST COMMUNICATIONS, INC.
ON STATE FORWARD-LOOKING COST STUDIES FOR
UNIVERSAL SERVICE SUPPORT**

U S WEST Communications, Inc. ("U S WEST") submits comments in response to the Federal Communications Commission's ("Commission" or "FCC") Public Notice[1] seeking comment on forward-looking cost studies proposed by some states to be used for intrastate universal service support.

I. THE COMMISSION REQUIRES THE STATES TO USE THE COMMISSION'S FORWARD-LOOKING COST METHODOLOGY OR A STATE COST METHODOLOGY APPROVED BY THE COMMISSION FOR UNIVERSAL SERVICE SUPPORT

In the Universal Service Order,[2] the Commission concluded that a cost methodology based on forward-looking economic cost should be used to calculate the cost of providing universal service for high cost areas, because it best reflects the

---

[1] Public Notice, DA 98-1055, rel. June 4, 1998 ("Notice").

[2] In the Matter of Federal-State Joint Board on Universal Service, Report and Order, 12 FCC Rcd. 8776 (1997), appeal pending sub nom. Texas Office of Public Utility Counsel v. FCC, No. 97-60421 (5th Cir.) ("Universal Service Order").

cost of providing service in a competitive market for local exchange service.[3] The Commission said that it would establish a forward-looking universal service support mechanism based on forward-looking economic costs for non-rural LECs which a state could use or for a state to develop its own cost study, within the Commission's guidelines, to determine the level of universal service support for carriers in that state.[4]

A. State Forward-Looking Cost Studies Must Be Approved By The Commission

The Commission said that "all methodologies used to calculate the forward-looking economic cost of providing universal service in rural, insular, and high cost areas must meet" the criteria adopted by the Commission.[5] For those states who choose to submit their own forward-looking economic cost studies, the Commission said that it would seek comment on those studies and determine whether they meet the Commission's criteria.[6] The Commission also said that only if it finds "that the state has conducted a study that meets our criteria will we approve those studies for use in calculating federal support for non-rural eligible telecommunications carriers rural, insular, and high cost areas . . . ."[7]

---

[3] Id. at 8792 ¶ 26.

[4] Id.

[5] Id. 8913 ¶ 250.

[6] Id. at 8912 ¶ 248.

[7] Id.

B. Criteria For Forward-Looking Economic Cost Determinations

Consistent with the criteria set out in the Joint Board recommendation,[8] the Commission adopted the following criteria which all forward-looking cost methodologies must meet:

(1) The technology assumed in the cost study or model must be the least-cost, most-efficient, and reasonable technology for providing the supported services that is currently being deployed. A model, however, must include the ILECs' wire centers as the center of the loop network and the outside plant should terminate at ILECs' current wire centers. The loop design incorporated into a forward-looking economic cost study or model should not impede the provision of advanced services. Wire center line counts should equal actual ILEC wire center line counts, and the study's or model's average loop length should reflect the incumbent carrier's actual average loop length.

(2) Any network function or element, such as loop, switching, transport, or signaling, necessary to provide supported services must have an associated cost.

(3) Only long-run forward-looking economic cost may be included, using a sufficiently long-run period that all costs may be treated as variable or avoidable. The costs must not be the embedded cost of the facilities, functions, or elements. The study or model, however, must be based upon an examination of the current cost of purchasing facilities and equipment, such as switches and digital loop carriers.

(4) The rate of return must be either the authorized federal rate of return on interstate services or the state's prescribed rate of return for intrastate services.

(5) Economic lives and future net salvage percentages used to calculate depreciation expense must be within the FCC authorized range.

(6) The cost study or model must estimate the cost of providing service for all businesses and households within a geographic region. This includes the provision of multi-line business services, special access, private lines, and multiple residential lines.

---

[8] Majority State Members' Second State High Cost Report at 2-6.

(7) A reasonable allocation of joint and common costs must be assigned to the cost of supported services.

(8) The cost study or model and all underlying data, formulae, computations, and software associated with the model must be available for review and comment. All underlying data should be verifiable, engineering assumptions reasonable, and outputs plausible.

(9) The cost study or model must include the capability to examine and modify the critical assumptions and engineering principles such as cost of capital, depreciation rates, fill factors, input costs, overhead adjustments, retail costs, structure sharing percentages, fiber-copper cross-over points, and terrain factors.

(10) The cost study or model must deaverage support calculations to the wire center serving area level at least and, if feasible, to even smaller areas such as a Census Block Group, Census Block, or grid cell.[9]

The Commission said that a state cost study submitted for the purposes of calculating federal universal service support must be the same cost study that is used by the state to determine intrastate universal service support levels.

II. U S WEST'S COMMENTS ABOUT THE COST STUDIES SUBMITTED BY MONTANA, MINNESOTA, AND NEBRASKA

Forward-looking cost studies selected by the states to be used in lieu of the federal mechanism for determining universal service high cost support have been submitted by Hawaii, Illinois, Indiana, Kentucky, Louisiana, Michigan, Minnesota, Montana, Nebraska, North Carolina, Puerto Rico, and South Carolina. U S WEST provides comments about the cost studies submitted by three states within U S WEST's region with which U S WEST is the most familiar: Minnesota, Montana, and Nebraska.

[9] Universal Service Order, 12 FCC Rcd. at 8912-16 ¶ 250.

A. Montana

By a vote of 5 to 0, the Montana Public Service Commission ("MPSC" or "Montana Commission") unanimously selected the BCPM for purposes of computing the amount of federal universal service support for Montana after conducting a contested case proceeding under the Montana Administrative Procedures Act, Section 2-4-601 et seq. of the Montana Code Annotated. The Montana PSC evaluated two cost models, the BCPM 3.1 and the HAI 5.0a.

The Montana Commission recognized the vital importance of universal service support to Montanans because of the state's unique demographic and geographic characteristics:

> Montana stands apart from most other states in terms of its land and population characteristics. Montana is one of the nation's least densely populated states. This fact places Montanans at risk of not enjoying the basic telephone services that urban consumers may take for granted.
>
> The 1996 Act envisions a dynamic definition of basic service and consumers likely would agree. The FCC recognized that what was once a luxury (e.g., touch tone) is now basic service. Congress required the FCC to define basic service for purposes of computing forward looking economic costs; it did so in its Universal Service Order. From the perspective of the Montana Commission and many Montana consumers, the definition is circumstantial as well as dynamic. Services like PCS and broadband internet are not taken for granted, are unavailable in some areas of Montana, and may in fact be critical to rural Montanans' access to medical and other essential services. Toll service also may be a lifeline to essential services in many areas of our state. From the perspective of rural Montanans, basic service may include services not considered basic in states more urbanized than Montana. Therefore, to achieve the Congress's and the Montana Legislature's universal service goals, the model which computes universal service costs for Montana's high cost areas should be as accurate as the parties' hypothetical cost models permit.[10]

---

[10] In the Matter of the Investigation of the Commission Implementation of a Forward Looking Universal Service Cost Model, Docket No. D97.9.167, Final Order, May 26, 1998 ("Montana Order") at 26.

(1) Selection Of The BCPM

The Montana Commission concluded that "the results of the BCPM 3.1 more accurately reflect Montana's unique characteristics, such as its mountainous terrain, low population density, and large geographic area."[11] In the Text Document filed with this Commission, the Montana Commission provided its explanation of why the BCPM satisfies the Commission's criteria for a forward-looking economic cost model.[12] See also Attachment A for an overview explanation of the BCPM and a detailed explanation about how it complies with the Commission's criteria.

(2) The Montana Commission Rejected The HAI Model, Because It Was Unreliable And Its Sponsors Did Not Permit An Open Public Scrutiny Of The Model

Accuracy of a cost model in computing universal service costs for Montana's high-cost areas was of paramount importance to the Montana Commission. However, when it examined the HAI model, it found evidence of HAI's "inability . . . to locate customers."[13] "[I]n rural areas in Montana geocoding was not accurate – the HAI successfully geocoded only about 8.5% of actual customer locations in three test counties . . . . [T]he HAI gives a false sense of accuracy."[14] The Montana Commission rejected HAI because the "HAI model does not appear to capture Montana's unique demographic characteristics. The evidence was undisputed;

---

[11] In the Matter of Federal-State Joint Board on Universal Service, CC Docket 96-45, Model Submission Of The Montana Public Service Commission, May 22, 1998.

[12] Montana Text Document.

[13] Montana Order at 28-29.

[14] Id. at 22.

geocoding did not locate U S WEST's Montana rural population with much accuracy."[15]

In addition to finding that the HAI was unreliable, the Montana Commission was concerned that the sponsors of the HAI model did not permit the model to be scrutinized:

> Whereas U S WEST subjected its model (the BCPM) to the rigor of cross examination, AT&T did not. AT&T's decision to withdraw a key witness insulated the HAI model from critical cross examination in this Docket; AT&T foreclosed others from exploring the HAI model's deficiencies.[16]

In the final analysis, the Montana Commission concluded "that the BCPM better achieves Congress's and the Montana Legislature's universal service goals."[17] The Montana Commission found it incomprehensible that the HAI model and its proponents purported to determine that no universal service funding was needed in a rural state such as Montana.[18]

The Montana Commission addressed each of the Commission's criteria when it made its selection of a cost proxy model for universal service support. U S WEST commends the Montana PSC for its in-depth analysis and understanding of the two models and U S WEST supports the Montana Commission's final selection of the BCPM.

---

[15] Id. at 28-29.

[16] Id. at 29.

[17] Id. at 30.

[18] Id. at 26-27.

B. Minnesota

By a narrow vote of 3 to 2, the Minnesota Public Utilities Commission ("Minnesota PUC") selected the HAI model to compute the amount of federal universal service support for Minnesota. The Minnesota PUC evaluated two cost models, the BCPM3.1 and the HAI 5.0.

(1) Selection Of The HAI Model

The Minnesota Commission concluded that the HAI model satisfied the Commission's criteria for a forward-looking cost model to be used for purposes of determining universal service support.[19] The Minnesota Commission concluded that "HAI provides the more accurate and reliable method for estimating the costs of serving Minnesotans living in rural, insular and high cost areas."[20]

(2) The HAI Model Is Unable To Locate Rural Customers Accurately And It, Therefore, Understates The Cost Of Distribution Plant Facilities

Even though the Minnesota Commission selected HAI, it also acknowledged in its Order that the ability of a cost model to locate customers was a critical component to determining the costs to provide service to those customers:

> The distribution portion of a telephone network constitutes a major component of the total network costs. Assumptions about customer locations influence distribution designs, which influence distribution costs, which heavily influence the total network costs.
>
> Two important distinctions between the BCPM and the HAI are 1) the

[19] In the Matter of the State of Minnesota's Possible Election to Conduct Its Own Forward-Looking Economic Cost Study to Determine the Appropriate Level of Universal Service Support, Docket No. P-999/M-97-909, Order Adopting Cost Study, issued June 4, 1998 ("Minnesota Order").

[20] Id. at 4.

manner in which the models estimate subscriber location, and 2) the manner in which these locations are aggregated, or "clustered," for purposes of developing distribution plant.[21]

The geocoding methodology employed by HAI has been severely criticized by the BCPM joint sponsors, with good reason.[22] The Minnesota Commission explained that "[Geocoding] involves the assignment of latitude and longitude coordinates to actual street addresses."[23] It said that geocoding "identifies the actual locations of most telephone customers . . . ."[24]

In the case of residence customer locations, the Minnesota Commission explained that the initial data is provided by Metromail, Inc. who has compiled a national database of household level consumer information that "includes deliverable postal addresses."[25] Metromail compiles this residence database

---

[21] Id.

[22] HAI's geocoding methodology and the model's consistent understatement of distribution plant costs are now the subject of an ongoing series of ex parte presentations made to the FCC by Sprint, one of the BCPM joint sponsors. Although AT&T, MCI, and their contract vendor, PNR & Associates, claimed that certain critical data, such as (1) the actual polygon boundaries for each HAI cluster and (2) the number of customers placed at actual geocoded locations versus the number of customers located by default on census block boundaries, are proprietary, Sprint gained access to some of the data in a Nevada Commission proceeding. In its response dated May 8, 1998 to the HAI sponsors' ex parte letter to the FCC, Sprint explained the magnitude of the flaw in HAI: "The data shows that for 424 out of 496 or 85% of the clusters for which data was provided, the HAI model builds less distribution plant than would be necessary just to simply connect the customer location points in the cluster." AT&T, MCI, and PNR have continued to resist requests for underlying PNR data for other states, and AT&T and MCI continue to downplay the significance of this flaw in their model.

[23] See Text Document: Minnesota at 14.

[24] Id. at 13 (emphasis added).

[25] Id. (emphasis added).

"primarily from telephone white pages directory data."[26] However, as users of directories already know, "actual locations" and "deliverable postal addresses" for most rural telephone customers, who may reside for example on Rural Route 2, do not appear in the white pages directories. As U S WEST has explained in its filings in this docket, customers in rural areas may be the most difficult to locate accurately, but they are frequently the high-cost customers who must be targeted precisely to ensure that they continue to receive local service at affordable rates.

On June 16, 1998, U S WEST filed Supplemental Direct Testimony with the Minnesota Commission explaining in detail this defect in HAI's geocoding methodology which results in significantly and consistently understating distribution plant costs for rural customers. The issue addressed by this supplemental testimony is: "Whether the distribution plant modeled by HAI 5.0a is adequate to serve customers in their 'actual' locations as identified by PNR and Associates (PNR)."[27] A copy of this Supplemental Direct Testimony is attached as Attachment B. The conclusions reached by Messrs. Emmerson and Duffy-Deno confirm are shocking:

> HAI 5.0a's estimate of the required investment in rural, low-density areas is too low.
>
> The customer locations assumed by HAI 5.0a for the purpose of "building" plant are inconsistent with the "actual" locations in the underlying polygon (convex hull) clusters.[28]

---

[26] Id. at 14.

[27] Supplemental Directory Testimony of Richard D. Emmerson & Kevin T. Duffy-Deno, Exhibit EDD-2 ("EDD Supplemental Direct Testimony").

[28] Id. at 1.

The assumptions and methodology used by HAI's geocoding to determine customer locations seriously and significantly underestimate the distribution costs and, therefore, the total network costs.

The Montana Commission may not have had the data and the technical explanation about why the HAI model was able to locate accurately only about 8.5% of actual customer locations in three test counties, but these results were sufficient to cause the Montana Commission to find that HAI's geocoding methodology was suspect and ultimately unreliable in locating rural customers accurately.

The Minnesota Commission has not yet had an opportunity to consider the Supplemental Direct Testimony filed by U S WEST on June 16, 1998, which provides the technical explanation about the flaw in the HAI model for its understatement of costs for distribution plant facilities. On the basis of this new evidence, U S WEST plans to urge the Minnesota Commission to reconsider its selection of the HAI model. The credibility of HAI to locate rural customers accurately and to determine the cost of distribution plant facilities for providing service to these customers is in serious doubt.

For this reason, U S WEST requests that this Commission not approve the Minnesota Commission's selection of the HAI model. This defect in the HAI model undermines the very purpose of universal service support mechanisms, which are important to states such as Minnesota who have rural customers in supra high-cost areas dispersed throughout the state.

C. Nebraska

By a vote of 5 to 0, the Nebraska Public Service Commission ("Nebraska PSC" or "Nebraska Commission") selected BCPM 3.1, following a proceeding in which it considered extensive written and oral evidence relating to the BCPM and the HAI models. Following its selection of BCPM 3.1, the Nebraska Commission held a second hearing to determine the appropriate values to use for certain inputs to the model. The Commission again considered extensive written and oral evidence and issued a subsequent order directing the use of specific values for several of the model's inputs.[29]

The Nebraska Commission's decision to select BCPM 3.1 over the HAI model has substantial support. BCPM complies fully with each of the Commission's criteria. See also Attachment A for an overview explanation of the BCPM and a detailed explanation about how it complies with the Commission's criteria.

U S WEST and GTE demonstrated compliance with those criteria through hundreds of pages of written testimony and extensive oral testimony from the cost modelers who developed BCPM 3.1, the engineers who developed the network architecture and outside plant inputs for the model, and other expert witnesses.

The Nebraska Commission's preference for BCPM over the HAI model was not a close call. In a unanimous 5 to 0 vote for BCPM 3.1 over the HAI model, the Nebraska PSC concluded based on "volumes of exhibits, pre-filed testimony, and

[29] In the Matter of the Nebraska Public Service Commission, on its own motion, to conduct an investigation to determine which cost study model should be recommended to the FCC for determining federal universal service support, Application No. C-1633, Order, entered April 27, 1998 ("NE Order").

oral evidence" that "BCPM appears to bring us closer to the objectives of universal service."[30] The Commission concluded that the selection of BCPM 3.1 "will ensure a quality network in high cost areas of our state that is technically comparable to the network found in urban areas."[31] By contrast, the Commission found that the HAI model assumes "a network of lesser quality."[32]

The Nebraska Commission addressed each of the Commission's criteria when it made its selection of a cost proxy model for universal service support. U S WEST commends the Nebraska PSC for its in-depth analysis and understanding of the two models and U S WEST supports the Nebraska Commission's final selection of the BCPM.

III. THE COMMISSION'S CRITERION FOR DEPRECIATION INPUTS DOES NOT REFLECT THE TRUE ECONOMIC LIVES FOR SEVERAL CATEGORIES

The Commission's fifth criterion for forward-looking cost models includes the following requirement: Economic lives and future net salvage percentages used in calculating depreciation expense should be within the FCC-authorized range and use currently authorized depreciation lives.

However, U S WEST believes that the FCC's range does not reflect true economic lives for several categories and, therefore, it supports Ameritech Michigan's request for a waiver of compliance with the FCC's range.[33]

---

[30] Id. at 3.

[31] Id.

[32] Id.

[33] Ameritech Michigan Request for Waiver, filed May 26, 1998.

BCPM 3.1 includes two different sets of inputs for depreciation expense. The first set of inputs consists of default values that use economic lives and future net salvage percentages that are within the FCC's authorized range. These values comply with this criterion of the FCC's checklist.

The second set of inputs uses economic lives that the BCPM sponsors deem appropriate. U S WEST believes these lives more accurately reflect forward-looking, economic lives than do the lives used in the FCC's range. The economic lives U S WEST advocates are:

a. Aerial and Underground Cable Accounts: 15 year life;

b. Buried Cable Account: 20 year life;

c. Digital Switching Account: 10 year life;

d. Digital Circuit Account: 10 year economic life; and

e. Non-Metallic Cable Account: 20 year economic life.

IV. CONCLUSION

U S WEST supports the selection of the BCPM by the Montana and Nebraska Commissions. The Commission should approve their selection of that cost model. U S WEST does not support the selection of the HAI model by the Minnesota Commission, because it is unable to locate rural customers accurately and it, therefore, understates the costs of distribution plant facilities required to provide service to these customers. U S WEST recommends that the Commission not approve the Minnesota Commission's selection of that model. U S WEST also believes the economic lives used in the BCPM more accurately reflect forward-looking, economic lives than do the lives used in the FCC's range.

Respectfully submitted,

U S WEST COMMUNICATIONS, INC.

By: John L. Traylor

Robert B. McKenna
John L. Traylor
Suite 700
1020 19th Street, N.W.
Washington, DC 20036
(303) 672-2798

Its Attorneys

Of Counsel,
Dan L. Poole

June 25, 1998

ATTACHMENT A

BCPM Complies With The Commission's Criteria

A. An Overview Of BCPM 3.1

BCPM 3.1 is a computer model designed to estimate benchmark costs for providing business and residential basic local telephone service nationwide. It is based in Microsoft Excel with a user interface developed in Visual Basic for Applications.

The model is comprised of a series of modules in functional areas pertinent to the design and costing of a forward-looking telecommunications network. These modules include:

1. Preprocessor Module: This module formats some of the raw input data for further processing, identifies the locations of customers within the wire center, and builds the grid system and feeder plant routes used to design the distribution cable system.

2. Outside Plant Module: This module designs and costs the distribution cable system and costs the feeder plant.

3. Switch Module: This module designs and costs the digital network of host/remote/standalone switches based on the locations of the actual in-place network.

4. Transport Module: This module designs and costs the Synchronous Optical Network Technology ("SONET") interoffice transport system.

5. Capital Cost Module: This module develops depreciation, rate of return, and tax factors and applies them to the investment accounts to produce the capital cost.

6. Report Module: This module summarizes the results of the previous modules. This module also determines the operating expense associated with universal service.

1. Customer Location Methodology

BCPM 3.1's customer location algorithm uses Census data at the Census Block ("CB") level and wire center boundaries provided by Business Location Research to determine the location of customers. The model's customer location algorithm overlays wire centers with grids that focus on road miles where people are more likely to be located. The model uses dynamic grids, or grids that vary in size, to ensure that the number of customers included in a grid takes into account Carrier Serving Area ("CSA") engineering guidelines.

The model carries out a series of reaggregation steps to combine grids into various sizes, consistent with an efficient network design. The size, cost characteristics, and number of lines for each grid are integrally linked to telephone engineering CSAs and Distribution Areas ("Das"). There are a number of steps involved in this process:

1. Specify the appropriate wire center boundaries;

2. Use the CB level of data that falls within the corresponding wire center boundary; and

3. Create the variable size grids from the CB data within the wire center boundaries.

2. Outside Plant Methodology

The loop module in BCPM 3.1 develops the loop costs associated with providing basic telephone service. The assumptions in the loop module were developed by a team of engineers with many years of experience developing and installing outside plant.

Loop Lengths

The engineering protocols the model uses to design outside plant include an average maximum loop length for each CSA that is less than 12,000 feet. To ensure compliance with this standard, the model generally limits the size of ultimate grids which emulate CSAs to 1/25th of a degree latitude and longitude (approximately 12,000 feet by 14,000 feet). The design of the CSAs ensures that the maximum cooper loop length from the Digital Loop Carrier ("DLC") site to a customer will not exceed 18,000 feet.

Feeder Routes

The model uses a maximum of four main feeder routes that run directly east, north, west and south from the wire centers to serve four feeder quadrants. These routes run for 10,000 feet. The use of this distance is based on the assumptions that customers within 10,000 feet of a wire center typically are located in towns and that towns usually have a gridded street layout. Beyond 10,000 feet, the model determines the direction of each main feeder by relying on customer concentrations as reflected in the grid information data.

If the line count in the center 1/3 of a feeder quadrant is greater than 30% of the total feeder quadrant lines, the model typically uses a single feeder and that points to the population centroid of the entire feeder quadrant. If the line count in the center 1/3 of a feeder quadrant is less than 30% of the total feeder quadrant lines, the model splits the feeder into two main feeders. The model usually points each of these feeders at the population centroid in one half of the feeder quadrant. The model sizes each portion of the split main feeder according to the number of customers that each portion serves. This breakpoint takes into account the need to split the cable to avoid any natural barriers. If the model logic indicates a need to redirect or split the main feeder at the point 10,000 feet from the central office, the model runs a test to determine whether feeder length can be minimized by continuing in the cardinal direction, (north, south, east and west).

From the main feeder, subfeeders branch out toward the individual CSAs/ultimate grids. Subfeeder often is shared by more than one CSA/ultimate grid. For main feeders within 10,000 feet of the wire center, subfeeders may branch off every 1/200th of a degree boundary. Along a main feeder beyond 10,000 feet of the wire center, subfeeder branches out at, most, once between 1/25th of a degree boundary.

Digital Loop Carriers

The model establishes a DLC site within each CSA at the road centroid of the ultimate grid. The use of DLCs is needed to account for loop lengths that exceed the copper/fiber breakpoint. The number of DLCs the model places at each DLC site depends on the number of lines that the CSA serves. The model uses two DLC categories, each of which provides multiple size options for remote and central office terminal sizes.

Other Outside Plant Inputs and Assumptions

Several other outside plant inputs and assumptions that BCPM 3.1 uses bear emphasis:

- The type of cable the model uses in the feeder system is determined based on the specified copper/fiber breakpoint.
- The model divides each CSA/ultimate grid into four potential DAs. The number of DAs depends on the number of lines within each quadrant of the CSA/ultimate grid.
- United States Geological Survey and Soil Conservation Service data for four terrain characteristics that impact the structure and placement cost of telephone plant are included as inputs to BCPM 3.1 by CBG and assigned to an ultimate grid.
- The model recognizes underground, buried, and pole structure that is shared with power and cable industries.

3. Switching

The BCPM-Switching Module is designed to develop per line switching costs for Universal Service Fund ("USF") applications and to provide the basis for unbundled network element ("UNE") costs. The model:

1. Uses separate cost equations for host, stand-alone, and remote switches;

2. Provides global data inputs for those study areas where specific data are not available;

3. Can accept switch investments from several sources;

4. Analyzes input data files to determine whether switch capacity constraints have been exceeded for any wire center, and if so, places an additional switch in that wire center; and

5. Determines the realistic portion of each switch attributable to basic telephone service, by means of engineering based partitioning algorithms derived from the Audited LEC Switching Models ("ALSMs").

The process BCPM 3.1 uses to determine per line switching costs for universal service consists of four phases. First, the model compiles the switch-specific data inputs that are used to reflect switch investment. Second, the model generates total switch investments by functional category ("FCAT") for each switch.

Third, the model uses these FCAT investments to generate a busy hour unit investment for each basic switch function, based on the subscriber calling usage rates input into the model. Finally, universal service investment per line is computed from the busy hour functional unit investments.

4. Transport

In the Transport module, BCPM 3.1 uses information on existing interoffice traffic routing relationships between remote/host/tandem switches to develop forward-looking transport costs using SONET technology. The Transport module deploys sophisticated optimization algorithms to determine the most efficient ring configuration for a given study area. These algorithms utilize actual data on remote-host-tandem switch homing relationships, vertical and horizontal coordinates, number of working lines, and access line to trunk ratios (used to derive traffic characteristics). The Transport module is an extremely flexible Excel spreadsheet model, permitting cost analysis for an area as small as a single exchange or as large as an entire company. The user also has the ability to alter all of the primary transport cost inputs. The module:

1. Utilizes efficient SONET bandwith given the specified host and remote locations, number of access lines, and trunks;

2. Uses only SONET technology that is currently available in the market;

3. Provides one level of redundancy via what is commonly referred to as self-healing rings;